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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
JACOBS, TODD D	

ART UNIT	PAPER NUMBER
3746	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	10/587,234	DAINEZ ET AL.	
	Examiner	Art Unit	
	TODD D. JACOBS	3746	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE *3* MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 December 2009*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-10,18 and 19* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-10,18 and 19* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *24 July 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☒ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date *7/24/2006*.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Election/Restrictions

1. Applicant's election without traverse of claims 1-10, 18-19 in the reply filed on 12/14/2009 is acknowledged. This election withdrew claims 11-17.

Claim Objections

2. Claims 1-10, 18-19 are objected to because of the following informalities: None of these claims have proper amended indicators; each claim appears to have something amended in it yet each one says "original" and there are no underlined changes. Appropriate correction is required.

Claim Rejections - 35 USC § 112

3. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

4. Claims 4-10, 19 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

5. Claim 4 states "increased quant the measured phase is negative" and it is unclear what this is supposed to mean. For the purposes of this examination, "quant" will instead be interpreted to be "when". Claim 7 states "middle point of the permanence of the feed current at zero" yet the word permanence is confusing there because the feed current isn't staying at zero *permanently*. "Permanence" will instead be interpreted to be "duration". Claim 19 states "the control central" but this is confusing and lacks antecedent basis. It will instead be interpreted to be "the processing unit".

Claim Rejections - 35 USC § 102

6. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

7. Claims 1-10, 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Tojo et al (5,980,211).

8. In re claims 1-2, Tojo discloses a linear motor (20) comprising a stator (21) and an actuator (16), the stator being fed by a controlled voltage the controlled voltage being applied to the linear motor and adjusted by a processing unit (6) by means of a variable frequency inverter, the linear motor moving a load from the actuator displacement, the linear motor forming a resonant assembly with the load, the resonant assembly having a resonance frequency, the linear motor being characterized in that the processing unit is configured to control a displacement range of the actuator by means of the controlled voltage, the processing unit selectively increasing or decreasing the displacement range in a proportional manner to the variations of the resonance frequency throughout the load variations and to dynamically keep the resonant assembly in resonance (see at least Fig 7, specifically step 17 where the frequency is changed in order to keep resonance). Note that regarding the "applicable to a cooling system", this has been interpreted as intended use and this system can certainly be applicable to a cooling system.

9. In re claims 3 and 19, Tojo discloses a linear compressor according to claim 2, characterized in that the controlled voltage generates a feed current that circulates in the linear motor, the processing unit measuring a feed phase of the feed current and the dynamic phase of the piston of the linear compressor, the processing unit measuring the difference between the

feed phase and the dynamic phase (see Fig 7, step 16) and establishing a measured phase (this is the calculated phase difference from step 16), the processing unit adjusting the controlled voltage so that the value of the measured phase will be null (see Fig 7, step 17, sub-step 1).

10. In re claim 4, Tojo discloses a linear compressor according to claim 3, characterized in that the controlled voltage is decreased when the value of measured phase is positive and increased when the measured phase is negative (depending on the value of the difference as discussed above, step 17 will perform these functions).

11. In re claims 5-7, Tojo discloses a linear compressor according to claim 4, characterized in that the feed phase is obtained from a pre-defined moment of the feed current (regarding claim 6, see Fig 6, 41 and 42 are specific points/moments that are the zero crossing point; note regarding claim 7 that if this is an instantaneous point as it should be, this will be the midpoint).

12. In re claims 8-10, Tojo discloses a linear compressor according to claim 7, characterized in that the dynamic phase is obtained from a signal of piston displacement; by means of a displacement sensor electrically associated to the processing unit; and from the position of piston displacement (position sensor 4; note that this could also be instead a position/speed sensor as discussed on col 8 lines 30-35).

13. Claims 1-5, 19 are rejected under 35 U.S.C. 102(b) as being anticipated by Yoo et al (2003/0026702) or Yoshida et al (2004/0005222).

14. In re claims 1-2, Yoo and Yoshida disclose a linear motor (unlabeled in each) comprising a stator and an actuator (each are unlabeled), the stator being fed by a controlled voltage the controlled voltage being applied to the linear motor and adjusted by a processing unit (6) by means of a variable frequency inverter (180 of Yoo, 6 of Yoshida), the linear motor moving a load from the actuator displacement, the linear motor forming a resonant assembly with the

load, the resonant assembly having a resonance frequency, the linear motor being characterized in that the processing unit is configured to control a displacement range of the actuator by means of the controlled voltage, the processing unit selectively increasing or decreasing the displacement range in a proportional manner to the variations of the resonance frequency throughout the load variations and to dynamically keep the resonant assembly in resonance (see at least paragraph 80, lines 1 to 6 and Fig 12 of Yoshida; see also Fig 14 of Yoshida for a separate embodiment that is also performing frequency changes based on phase difference; further, regarding Yoo, see Figs 3 and 4 for information on how the frequency changes are made based on the phase differences). Note that regarding the "applicable to a cooling system", this has been interpreted as intended use and this system can certainly be applicable to a cooling system.

15. In re claims 3 and 19, Yoo and Yoshida disclose a linear compressor according to claim 2, characterized in that the controlled voltage generates a feed current that circulates in the linear motor, the processing unit measuring a feed phase of the feed current and the dynamic phase of the piston of the linear compressor, the processing unit measuring the difference between the feed phase and the dynamic phase (see SP3 and decisions thereafter on Fig 4 of Yoo; see also step S22 on Fig 14 of Yoshida, as well as paragraph 80 of Yoshida) and establishing a measured phase (this is the calculated phase difference from each reference; in the case of Yoo, this measured phase is considered to be the difference plus/minus 90°), the processing unit adjusting the controlled voltage so that the value of the measured phase will be null (this is the step of each reference to decrease that difference to zero).

16. In re claim 4, Yoo and Yoshida disclose a linear compressor according to claim 3, characterized in that the controlled voltage is decreased when the value of measured phase is

positive and increased when the measured phase is negative (depending on the value of the differences as discussed above each reference will perform these functions).

17. In re claim 5, Yoo and Yoshida disclose a linear compressor according to claim 4, characterized in that the feed phase is obtained from a pre-defined moment of the feed current (although undisclosed where/when this takes place, it is predetermined nonetheless).

Claim Rejections - 35 USC § 103

18. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

19. Claims 3-10, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tojo et al (5,980,211).

20. In regards to claims 3 and 19, without taking away from the above, Tojo may not exactly disclose measuring phases of each the current and piston then comparing them. Instead Tojo compares two *frequencies* and directly measures the phase difference between. However, there is no practical difference between the two methods. Since Tojo already discloses measuring the phase difference from two frequencies, one having ordinary skill in the art at the time of the invention would certainly be able to perform the task of measuring the phases first, then calculating the difference in order, for example, to have an easier time debugging (seeing more values calculated in a computer program would allow one to spot errors easily). Note that the rest of the claims in this subset, claims 4-10, are rejected by Tojo as discussed above.

21. Claims 3-5, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoo et al (2003/0026702).

22. In regards to claims 3 and 19, without taking away from the above, Yoo may not exactly disclose measuring phases of each the current and piston then comparing them. Instead Yoo compares two *frequencies* and directly measures the phase difference between. However, there is no practical difference between the two methods. Since Yoo already discloses measuring the phase difference from two frequencies, one having ordinary skill in the art at the time of the invention would certainly be able to perform the task of measuring the phases first, then calculating the difference in order, for example, to have an easier time debugging (seeing more values calculated in a computer program would allow one to spot errors easily). Note that the rest of the claims in this subset, claims 4-5, are rejected by Yoo as discussed above.

23. Claims 1-5, 19 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al (2004/0005222).

24. In re claims 1, 19, Yoshida discloses the claimed invention as discussed above. However, Yoshida, without taking away from the above, may not exactly disclose the controlled voltage frequency being *equal* to the resonance frequency of the system. As discussed on paragraph 80, lines 5-6, these are slightly different. However, Yoshida does go on to say that "the deviation is only trifling...there is no practical effect on the efficiency". That said, it would have been obvious to one having ordinary skill in the art to have these be equal since it has been held that discovering an optimum value of a result effective variable involves only routine skill in the art. *In re Boesch,* 617 F.2d 272, 205 USPQ 215 (CCPA 1980).

25. Also, in regards to claims 3 and 19, Yoshida, without taking away from the above, may not exactly disclose measuring two phases then comparing them. Instead Yoshida may be comparing two frequencies and directly measuring the phase difference. However, there is no practical difference between the two methods. Since Yoshida already discloses measuring the phase difference from two frequencies, one having ordinary skill in the art at the time of the

invention would certainly be able to perform the task of measuring the phases first, then calculating the difference in order, for example, to have an easier time debugging (seeing more values calculated in a computer program would allow one to spot errors easily). Note that other claims in this subset, claims 2-5 are rejected by Yoshida as discussed above.

26. Claims 6-10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Yoshida et al (2004/0005222) or Yoo et al (2003/0026702) in further view of Tojo et al (5,980,211).

27. Yoshida and Yoo disclose the claimed invention as discussed above. However, neither discloses the elements of claims 6-7, specifically requiring that the current sampling is done when the current is passing through zero, or a midpoint thereof if there are multiple instances of passing through zero. First, it would have been obvious because there must be current measured somewhere and there is no criticality of where to measure. Therefore, it would have been an obvious design choice for someone having ordinary skill in the art to make. Further, Tojo, as described above, discloses measuring the currents at minimum points through zero for measurement. This allows an accurate and consistent measure. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify Yoshida or Yoo in view of Tojo in order to achieve the advantages mentioned above.

28. In re claims 8-10, Yoshida and Yoo disclose a linear compressor according to claim 7, characterized in that the dynamic phase is obtained from a signal of piston displacement; by means of a displacement sensor electrically associated to the processing unit; and from the position of piston displacement (see Yoshida Fig 14, step S21 regarding a position sensor; also see Yoshida equation 2 for the non-physical sensor and see 30 of Yoo). Note that if either non-physical sensor is not considered a sensor by applicant, it would have been obvious to use the physical sensor from the embodiment on Fig 14 of Yoshida, or also the sensor from Tojo in

order to have easier troubleshooting when having errors in the displacement readings (it may be easier to change the physical sensor vs. changing the software coding).

29. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Dorman (4,345,442) in view of Yoshida et al (2004/0005222) or Yoo et al (2003/0026702) or Tojo et al (5,980,211).

30. In re claim 18, Dorman discloses using a linear compressor in a cooling system comprising a thermostat (see "thermostat" on Fig 1). However, Dorman fails to disclose the limitations of claim 18 that are identical to claims 1-2 and 19. As discussed above, Yoshida, Yoo and Tojo each disclose these limitations. Using these compressors allows for known resonance control that may make a compressor more efficient. Therefore, it would have been obvious to one having ordinary skill in the art at the time of the invention to modify Dorman in view of Yoshida, Yoo or Tojo as discussed above in order to make Dorman a more efficient compressor.

Conclusion

31. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure. Chang et al (2005/0271526) discloses a remarkably similar algorithm to the instant invention (see Fig 3). Jeun discloses a system that assesses the current and driving phases to alter a driving voltage frequency. Sung et al (2004/0071556) discloses an algorithm that in part takes a phase difference and changes the voltage frequency in response.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to TODD D. JACOBS whose telephone number is 571-270-5708. The examiner can normally be reached on Monday - Friday, 7:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Devon Kramer can be reached on 571-272-7118. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

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Supervisory Patent Examiner, Art Unit 3746

/TODD D. JACOBS/
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